Sectt. II-27—45,606—19-10-39.

Edn & P H. (1940) **Department.**

ms **SERIES.**

G.O. No. 366 P H

61

Dated 31 - 1 - 1940

[Despatch Abstract.]

Water supply scheme - Bellary Municipal Council - Improvements Plans and estimates - Preparation - Ordered.

C.F 32.

PUBLIC WORKS DEPARTMENT.

In reply, please quote number, date and short title.

Received *Registered*

33328

From (Name) H. R. Dogra, Esq., B.Sc.,

(Designation) Chief Engineer, P.W.D., (General, Bui and Roads)

Post Box 410, (Station) Chepauk, Madras.

Telegraphic Address Quyad mica.

15 AUG 1939

To

The Secretary to Government,

Education and Public Health Department.

No. 71-WPH. 39-3, *dated* 10th August 1939.

Sir,

Enclosures

Spare Copies

WATER SUPPLY - BELLARY MUNICIPALITY - IMPROVEMENTS

INSTALLATION OF NEW PUMPS. - - - -

*****

I invite reference to my letter No. 5286-Wks., 37-8, dated 16th July 1938 and the orders of Government thereon in No.2713-Edn. & P.H., dated 29th July 1938. The previous correspondence on the subject would show that, to cope with the increased demand for water-supply in Bellary, the Municipal Council wanted that the existing pumps, which are capable of delivering only 5 to 6 lakhs gallons per day, should be replaced by bigger pumps capable of supplying 8 to 12 lakhs gallons per day. The Sanitary Engineer was not for providing for a large increase in supply until the capacity of the source to meet the demand was tested, and he also pointed out that such high pressures (297 feet head) as would obtain when such a large quantity is delivered through the existing 12" diameter pumping main, would not be permissible in the B Class pipes. The Municipal Council had consulted engineering firms and one of them had suggested a booster pump in the middle of the pumping main in order that, as required by the Sanitary Engi-

the

the pressure in the main might be limited the permissible safe head (200 feet head) when pumping the required increased quantity. As the Sanitary Engineer and the Municipal Council did not agree with each other, the matter was transferred from the Sanitary Engineering Department to the P.W.D. for investigation and report as to the capacities of the source and pumping main and "on the advantages of installing a booster pump to the existing main" - vide - note dated 5th January 1938 of the Hon'ble Minister for Public Health. The recommendations made after the P.W.D. investigation were approved by Government in the G.O.No.2713-Edn. & P.H., dated 29th July 1938 quoted above. They were as follows:--

(a) The existing source could be depended upon for a supply of 9,00,000 gallons per day. The quantity might be increased later to 12,00,000 gallons by additional wells or gallery.

(b) To relieve the pressure in the existing pumping main, and to limit it to the safe head permissible, it was enough if a booster pump was installed at about 30,000 feet from the main Pumping station and it was unnecessary to have a duplicate main immediately at a high cost. With a booster, an increased supply even up to 12,00,000 gallons could be pumped through the existing main.

(c) The Municipality might prepare plans and estimates on the above basis in consultation with the Sanitary Engineer.

II. In November 1938, the Sanitary Engineer raised some preliminary issues such as the relative economy of 'booster' and 'duplication of main' etc., and recommended the duplication of main in

preference to the installation of a booster. The comparative costs furnished by him were examined and it was pointed out to him that, even on the basis of his own figures, the booster would be more economical to meet the demand for the next 15 years, the probable life-time of the pumping plant to be installed. Another important defect in his proposals was this. The very object underlying the proposed improvements was that the existing main should no longer be subjected to high pressures, as now. But under the Sanitary Engineer's proposals (to have a duplicate 12" main at a cost of Rs.4,26,310/-) the existing main would still be subjected to a pressure up to 271 feet head as against the permissible 200 feet head. The proposals were therefore returned as unacceptable.

III. Now the Superintending Engineer (Public Health) again brings forward the proposal of duplicating the pumping main on the ground that he considers it to be an economic proposition. To be brief the situation is this. The recommendation of the Chief Engineer approved in G.O.No.2713-Edn. & P.H. dated 29th July 1938 was that a booster would do for the present instead of a duplicate main. In November 1938 the then Sanitary Engineer recommended a duplicate main in preference to a booster. Now the Superintending Engineer (Public Health) recommends a duplicate pumping main as well as a booster. In recommending his proposal, the Superintending Engineer (Public Health) has adduced two arguments:--

(i) The Superintending Engineer (Public Health) says that the life of a Cast Iron main may be taken as 30 years. The life assumed in the past has been only 30 years. The Public Health Authorities in Great

Britain

Britain would allow a loan period of only 30 years for the pipes. The maximum period of loan sanctioned by the local Government is also 30 years. I do not see why the generally accepted practice should be deviated from, in this case in considering the financial aspects of the proposals. When dealing with standards and practice we cannot go off the rails merely to justify a particular proposal.

(ii) The Superintending Engineer (Public Health)'s second line argument amounts to this. The Government bear half the initial cost and the Municipality only the other half. The Municipality is concerned more about the annual maintenance charges. If both the duplicate main and booster pump are installed, the annual charges to the Municipality will be reduced. Thus while the Municipality have to pay only half the initial cost they will have a distinct gain in annual recurring charges. Therefore from the point of affording relief to the Municipality and reducing their annual recurring charges the duplicate main is necessary.

I enclose herewith a statement showing the initial and recurring charges, assuming a loan period of 30 years the maximum period allowed by Government. It will be seen therefrom at the beginning there will be no gain either to the Municipality or Government by having the duplicate main now as proposed by the Superintending Engineer (Public Health); on the other hand the loss to Government will be Rs.7,884/- and to the Municipality Rs.457/- in the first year. Total loss Rs.8,341/-. At the end of about 15 years the loss to the Government will be the same Rs.7,884 by way of annuity charges towards one-half of the cpital cost forming the Government grant. The gain

to

to the Municipality will then be Rs.7,098/- per year but yet less than the loss of Rs.7,884/- to Government. Net loss still Rs.786/-. It seems that the Government sanctioned, as a special case a ¾ grant, for the existing scheme. If the same ¾ share is to be borne by Government in the case of the proposed improvements scheme also, the Municipality will have to find only the balance ¼ share and it would be all the more unfavourable to the Government to have a second pumping main immediately now. I leave it to Government to decide, in consultation with the Municipal Council if necessary, which course is preferable, whether to have the duplicate main now or some 15 years later. But I must point out that, if the principle is conceded that the Water Supply and Drainage Schemes of local bodies should be designed solely with a view to reduce the maintenance or annual costs of the local bodies alone, then the capital cost will be increased and Government will have to pay half the extra cost without corresponding additional advantage to them. A sound principle and which has been hitherto followed is to consider the total annual cost whatever may be the proportion in which they are shared by Government and quasi-Government bodies.

IV. Another point is tha fe of Cast Iron pipes can safely be taken as 60 years, should not the new duplicate main be so designed as to be capable of meeting the requirements till then? To do that, we would require 18" new main instead of 12" Main proposed, and the initial cost will then be increased from Rs.3,76,000/- to Rs.6,24,000/-

V. The object of the Chief Engineer's recommendations which were accepted in G.O.No.2713-Edn. & P.H., dated 29th July 1938 is that the Booster Static

should

station should be so located as to obviate the need for the duplication of the pumping main for 15 years to come. The existing main was laid some 15 years ago. It can safely be relied upon to give efficient service for another 15 years and more. The new pump to be installed now may have to be replaced then. On the other hand, the Superintending Engineer (Public Health)'s proposal is to locate the Booster station as near as possible to the reservoirs, more with a view to concentrate and economise in Establishment. But this requires, as already stated, a duplicate main at a high initial cost. As shown in the comparative statement enclosed, the economy of the duplication of main will not be realised for the next 15 years. It cannot now be said for certain what exactly the conditions would be after 15 years and what improvements, if any, will be required then. I do not, therefore, recommend the proposal to have a 12" duplicate main immediately now, in addition to the booster.

VI. I see no need to be prolonging the discussion with the Superintending Engineer (Public Health) as that will mean further delay. The Municipality has waited long enough and is impatient - vide - Government Memo No.824-1-E.2. P.H., dated 27th March 1939. I therefore request early orders if necessary after consulting the Municipality confirming the previous orders in G.O.No.2713-Edn.-& P.H., dated 29th July 1938, so that the Superintending Engineer (Public

Health)

Health) may be asked to proceed with the Booster proposal.

W Wanderwerkam

for Chief Engineer, P.W.D.

6 14.8.38

ENCLOSURES:--

One statement of
comparative costs.

.N.11/8

Bellary Water works improvements – Electrification of Pumping Plant.
– Comparative Costs, assuming 30 years loan period.

9

For Boosbi above as recommended by the Chief Engineer	For Boosbi Cum Duplicate main as recommended by the S.E.(P.H)

Capital Cost

	Rs		Rs
Pumps and Electrical Connections at Headworks and Boosbi Station . . .	64,000	Pumps and Electrical connections at Headworks and Boosbi Station . . .	37,000
Pipe Connections at both Stations, Boosbi Station building with Staff Qrs and Balancing Tank	22,000	Pipe Connections 12" Duplicate main and Boosbi Station building	3,39,000
	86,000		3,76,000

ANNUAL COSTS

First year for a supply of 8 lakhs gallons sufficient for the existing population at about 15 gallons per head per day

	Annual Cost to Government Rs	Annual Cost to Municipality Rs		Annual Cost to Government Rs	Annual Cost to Municipality Rs
Annuity charges to repay Rs 86,000 @ 3½% in 30 years – Rs 4,676	2,338	2,338	Annuity charges to repay Rs 3,76,000 @ 3½% in 30 years – Rs 20,444	10,222	10,222
Establishment	–	3,000	Establishment	–	1,800
			Maintenance, repairs and renewals to new Duplicate Main, Say	–	1,000
B.H.P $11.3 \times \frac{3}{4} \times 24 \times 365 \times \frac{0.8}{16}$ = Rs 37,121	–	37,121	B.H.P $91 \times \frac{3}{4} \times 24 \times 365 \times \frac{0.8}{16}$ = Rs 29,894	–	29,894
	2338	42459		10,222	42,916

{ Loss to Govt by S.E's (RH) Proposal – Rs 7,884
Loss to Mty by SE's (P.H) Proposal – Rs 457
8,341

ANNUAL COSTS

After say 15 years for a supply of 10 lakhs gallons for a population of 70,000 at about 15 gallons per head per day.

Annuity Charges same as above	2,338	2,338	Annuity Charges same as above	10,222	10,222
Establishment – do –	–	3,000	Establishment – do –	–	1,800
			Maintenance etc of New main do	–	1,000
B.H.P $64 \cdot 5 \times \frac{3}{4} \times 24 \times 365 \times \frac{0.8}{16}$ = Rs 54,038	–	54,038	B.H.P $119 \cdot 5 \times \frac{3}{4} \times 24 \times \frac{365}{366} \times \frac{0.8}{16}$ = Rs 39,256	–	39,256
	2,338	59,376		10,222	52,278

{ Loss to Govt by SE's (R.H) Proposal – Rs 7,884
Saving to Mty by S.E's (P.H) Proposal – 7,098
Net Loss " " 786

3/20/4 89/

E&D H

Conv. 33328, from the C.E (B&R) No. 11-WPH dt 10-8-39

Memo 33328-1 E&D H dt 19/8/39

Water works. Bellary Dist. Improvements: Duplication of the pumping main and installation of a booster pump.

The C.E (B&R) is requested to submit copies of letters or notes containing the views of Mr. Westerdale and the S.E (D.H) on the improvements required for the Bellary water works. as it is difficult to follow the arguments advanced by him in the absence of the facts & materials on which such arguments are based.

SRK
18.10.39

Dy 90/23/4
19/8/39

To the C.E (B&R) (D&H)

PUBLIC WORKS DEPARTMENT.

Received ..... 19 . *Registered* 2-NOV 1939

Subject.

45666

WATER WORKS - BELLARY MUNICIPAL COUNCIL - IMPROVEMENTS - INSTALLATION BOOSTER PUMP VERSUS DUPLICATION OF PUMPING MAIN.

*****

ENCLOSURES.
No. .....
.....
Spare copies .....

No. 71-WPH./39-4,

Station Chepauk, Madras, , *Dated the* 30th October 1939.

From (Name) H. R. Dogra, Esq., B.Sc.,
(Designation) Chief Engineer, P.W.D., (General, Buildings and Roads)

To The Secretary to the Government of Madras,
EDUCATION AND PUBLIC HEALTH Department.

Sir,

I forward herewith copies of the following correspondence as required by Government:--

pp 12-15½ (i) Mr. Westerdale's letter No.131-C., dated 9th November 1938.

pp 23-26½ (ii) My reply No.71-W.P.H./39-1., dated 26th April 1939.

pp 33-35½ (iii) Letter of the Superintending Engineer (Public Health) No.583-C., dated 20th June 1939.

I considered it unnecessary to trouble Government with copies of the above correspondence as my letter to Government pp 1-1 No.71-W.P.H./39-3., dated 10th August 1939 was self-contained. My considered views on the subject were given after examining the

the merits of the case.

2. The main issues are:--

(i) Whether Water-Supply and Drainage Schemes for which Government pay half cost and more, are to be designed solely with a view to reduce the maintenance or annual recurring charges of the Local Bodies alone, even, if that course be detrimental to the interests of Government involving larger grant on initial outlay.

(ii) Whether a life of 60 years can be safely assumed for pipes, while the loan period usually adopted by recognised authorities in England and elsewhere is generally only 30 years.

I do not consider that any views other than what I have given in my letter No.71-W.P.H./39-3., dated 10th August 1939 will be acceptable and I request the orders of Government in the matter.

K. Ranganathan 1.11.39

for Chief Engineer, P.W.D.

1-11-39

ENCLOSURES:--

Copies of three letters

with two Blue print plans.

K.N.31/10

Sanitary Engineering

From

J.S. Westerdale Esq., B.Sc.,M.Inst.C.E.,

Superintending Engineer, P.W.D.
& Sanitary Engineer to Govt.,
Triplicane,Madras.

To

The Chief Engineer, P.W.D.
General,Buildings & Roads.

No. 7131-C dated 9-11-38

Sir,

Sub: Bellary Municipality- Water Supply-
Improvements.

Reference No.5286 Wks/37-8 dated 16-7-1938 and No. 5286 Wks/37-9 dated 6-8-1938.

Before advising the Municipality regarding the preparation of detail plans & estimates for a booster station suggested in para 4 of Memo No.5286 Wks/37-8 dated 16-7-1938 I examined the proposal in detail and have the following remarks to make.

2. Your remarks and recommendations may be summarised briefly as follows.

(i) The existing source can be depended upon to supply 9 lakhs of gallons per day. The ultimate demand of the town should be assumed at 12 lakhs of gallons per day to serve an ultimate population of 80,000 at 15 gallons per head per day.

(ii) The existing pumping main with a booster pump and balancing tank in the middle will do even for the ultimate demand (12,00,000 gallons per day).

(iii) The capacity of the pumping sets to be installed at the head works should suit the Booster scheme.

(iv) After watching the results of continuous pumping for some time, the question of additional infiltration works should be taken up, if found necessary.

(v) The Municipal Engineer should be asked to conduct tests as to the deterioration in the quality of water by pumping at depression heads of 4' and 5' and to report the

test results.

3. The existing water supply system provides for a supply of 6 lakhs of gallons per day for an ultimate population of 50,000 at 10 gallons per head per day plus 1,00,000 gallons per day to the Fort and Cantonment areas. The supply is pumped through a 12" cast iron (B class) main and is distributed to the town through two Service Reservoirs, constructed one over the other, the High Level Reservoir having an effective capacity of about 100,000 gallons and Low Level Reservoir with an effective capacity of about 1,14,000 gallons. In order to see how the component parts of the existing scheme will fit in with the proposed improvements, and to fix the size of the new pumping units, it is necessary to decide whether the scheme is to provide for 9 or 12 lakhs of gallons per day. Your letter dated 16-7-1938 is not definite on this point and I have to request your orders.

4. As regards the proposed installation of a Booster pump and a balancing tank in the middle of the existing pumping main, the comparative capital and maintenance costs including amortisement payment on the respective capital costs have been worked out in this office for both the Booster proposal and the duplicate main proposal for the ultimate demand of 12,00,000 gallons per day and I give below a summary of the figures. It will be observed therefrom that the proposal for two parallel mains works out cheaper by Rs.14,830/- in annual recurring expenditure.

	Booster proposal- Annual Expenditure.	Duplication of main Annual Expenditure.
1. Cost of Electrical Energy.	Rs.77,526	Rs.49,275
2. Establishment inclusive of repairs, renewals and other incidental charges.	10,754	4,925
3. Annuity on capital expenditure.	5,400	23,650
4. Repairs and maintenance of duplicate main.	..	1,000
Total.	93,680	78,850

Savings in favour of duplicate main is Rs.14,830/- annually.

5. The capital costs, maintenance costs and annuity costs are worked out in detail in separate statements enclosed herewith

from which the above summary is extracted.

6. Besides costing more, the Booster scheme has the disadvantages involved in the maintenance of an additional pumping station and staff, with the attendant risk of failure of pumps duplicated, while the duplicate main proposal has the positive advantage of 100% reduction in risk of complete breakdown of supply due to any failure in the main provided a spare unit of suitable pumping capacity for a single main is installed.

7. As regards the balancing tank proposed in connection with the Booster pump I shall be glad to know the exact purpose of this tank and how its capacity should be calculated or determined.

8. Even with the use of a Booster pump it is not possible to avoid exceed the working pressure for a 'B' class pipe. Provided the excess is not great this is not really important, particularly in the case of pipes tested by years of use like these, as the 50% below test pressure' standard of the B.S.S. is only a convention and is not based on any technical considerations. The existing main, though apparently all of 'B' class pipes actually works at a greater pressure than 200 feet as explained in the next para For the new 12" main however, in order to comply with B.S.S. practice, and our own general practice, I propose to use C class pipes for a portion of the main.

9. As stated in para 3 above, there are two Service Reservoirs in the existing scheme, one for serving High Level areas and the other for serving the Low Level areas, with effective capacities of 1,00,000 gallons and 1,14,000 gallons respectively. The existing pumps at the head works pump 161 gallons per minute against 258' head for 13 hours in the day to the High Level Service Reservoir (M.W.L. - 1547.50) and 236 gallons per minute against 232' head for 11 hours in the day to the Low Level Service Reservoir (M.W.L. - 1518.00) and are thus operating against two different heads both exceeding 200 feet. This factor which is in itself a complex one is rendered more complicated by the fact that the capacity of the two service reservoirs will become more disproportionate to the increased supply of 9 lakhs or 12 lakhs of gallons per day under the Improvements scheme. As the existing service reservoirs will be inadequate to balance the demand of

either 9 lakhs or 12 lakhs gallons supply it will be necessary to include provision for additional service reservoirs in the Improvements scheme.

10. As regards section (iv) in para (2) above it would be very risky to wait such a practical test of sufficiency of supply. Experience all over the Presidency has shown that any Municipal Water Supply source will ultimately be pumped to the utmost capacity of its pumps, and if that is too great for the source, the attendant evils of pumping beyond the critical velocity, with sand blowing, and sinking of wells and cracking of suction pipes may result. I consider therefore that we should not put in pumps of capacity beyond the assured yield at the source of supply. This is also important if for any reason you anticipat deterioration in quality with depression heads of 4 and 5 feet

11. As regards (v) in para 3 above I shall be obliged before I give any instructions to the Municipal Engineer if I may be informed the exact purpose of this test and why the act of pumping at 4' & 5' depression heads might be expected, in any circumstances, to cause or indicate deterioration in the supply.

12. I must apologise for a rather disjointed letter which is the result of multiple corrections, by me, to an office draft. Summarised the points in this letter are:-

(a) I recommend the duplicate pumping main in place of the proposed Booster pump as it will be far cheaper for the Municipality and at the same time be more reliable.

(b) Orders are requested if the scheme should be for 9 or 12 lakhs of gallons.

(c) It is pointed out that the scheme will involve new service reservoirs in the town. These need not however precede the provision of higher capacity pumps and the new pumping main, as the hours of pumping will automatically be limited to the capacity of the distribution system including the existing Service Reservoirs.

(d) I recommend that the new pumps should not exceed in capacity the proved safe yield of the existing source.

(e) Further instructions regarding the proposed test for deterioration with depression heads of 4 and 5 feet are requested.

T.S. Wolfe Rao 8/11/28

Superintending Engineer, P.W.

Particulars regarding total lift for the booster arrangement and Duplicate main.-

Booster arrangement.

Duty of plant at Head works.	...	833 gals.per min.
M.W.L. at Balancing tank.	1401.74	
Centre of pump ..	1326.25	
	75.49	
Frictional loss in 12" main. in a length of 29,040 grade 1/230.	126.26	
Other losses. ..	8.25	
	210.00	
Suction lift. ..	20.00	
Total.	230 feet.	

Booster Plant.

M.W.L. of S.R. (High level)	+ 1547.50	
Bottom of Balancing tank at the booster station. ..	+ 1396.74	
	150.76	
Frictional loss in 12" pumping main in a length of 19,695 ft. grade of 1/255 discharge 793 gals.per min. ..	77.24	
Other losses ..	12.00	
	240 feet	
M.W.L. of S.R. (Low Level)	+ 1518.00	
Bottom of Balancing tank. -	1396.74	
	121.26	
Frictional loss in 12" pumping main in a length of 19,695 ft. grade 1/215 discharge 860 gals. per min.	91.60	
Other losses. ..	12.14	
	235 feet.	

P.T.O.

Duplicate Main.

M.W.L. of S.R. -(H.L.)		+ 1547.50
Centre of Pump	...	+ 1326.25
		221.25
Frictional loss in 12" pumping main 48.735 feet discharging 397 gals. per min. @ a grade of 1/990.		49.23
Other losses.	...	9.52
		280.00
Suction lift.	...	20.00
		300 feet.
M.W.L. of S.R.- (L.L.)		+ 1518.00
Centre of pump.	...	1326.25
		191.75
Frictional loss in 12" main- discharge 430 gals. per min. $\frac{48.735}{850}$ ..		57.34
Other losses.		5.91
		255.00
Suction lift.		20.00
		275 feet.

[illegible]/8-11-38).

Scheme- Improvements to supply 12 lakhs of gallons a day- Comparative cost for duplication of pumping main and installation of Booster Station.

Description of items.	Installation of Booster Station.	Duplication of pumping main.
	24 hours pumping.	
Average rate of pumping.	833 g.p.m.	833 g.p.m
Rate of pumping to high level Service Reservoir.	Average rate up to Booster & 793 " beyond booster.	793 "
Hours of pumping.	9¾	9¾
Rate of pumping to low level Service Reservoir.	Average rate up to Booster & 860 " beyond booster.	860 "
Hours of pumping.	14¾	14¾
Distance of the booster station from the head works site.	30,000 ft.	
Capacity of the pumping plant at head works.	833 gals. against 230 ft.-116 B.H.P.	795 gals. against 300' 860 gals. " 275' 150 B.H.P.
Capacity of the booster plant.	793 gals. 240 ft.) 860 gals. 235 ft.) 120 BHP.	
	Maintenance Cost.	
Cost of establishment at the booster station.	1 Foreman Electrician @ 80-10⅔-120 .. Per month. 107-5-4 2 Electricians @ 35-3/2-50 .. 89-8-0 3 cleaners @ 14-15 .. 43-0-0 1 watchman @ 10/- .. 10-0-0 249/- or say Rs. 250/-	
	Per annum .. 3000	
Cost of energy @ 0.8 as.	236x⅔x24x365x0.8/16 77526	150x⅔x24x365x0.8/16 =49,275
Repairs & renewals etc. @ 15% of operating charges..	7754	4,925
Total..	88280	54,200

	Proposal for Booster Plant.		Proposal for duplicating the main.	
	Capital Cost.			
	Life 20 years.	Life 30 years.	Life 20 years	Life 30 years. & over.
Cost of pumping plant at Head Works.	22,000		29,000	
Pipe connections, valves etc.		2,000		2,000
Electrical equipment etc.	10,000		10,000	
Booster plant.	22,000			
Pipe connections.		2,000		2,000
Electrical equipment.	10,000			
Balancing tank 25,000 gals. capacity at G.L.		5,000		
Staff quarters.		8,000		
Cost of duplicate pumping main.				
12" C.I. pipe C.class =33500 @ 8/5-				2,78,569
Do. B.Class =15235 @ 6/14-				1,04,741
Total.	64,000	17,000	39,000	3,87,310
Annuity for repayment of loan @ 3½% interest in 20 years.	4,480		2,730	
Do. in 30 years.		918		20,914
Total annuity.	5,398 or Rs.5400/-		23,644 or Rs.23,650/-	

Data for 12" C.I.pipe.line, laying & jointing per Rft.

	B class	C class.
Cost of pipe 77.5 lbs.@ 8/- at site.	5-8-7	6-13-5 (95.75 lbs
Allowance for breakage.	0-2-3	0- 2-6
Earthwork excavation. ..	0-2-10	0- 2-10
Laying ..	0-3-0	0- 3-0
Jointing..	0-7-7	0- 8-7
	6-8-3	7-14-4
Specials @ 5%.	0-5-2	0- 6-4
	6-13-5 or	8- 4-8
	6-14-0	8-5-0

Difference in annuity.-

	23,650
	- 5,400
Against duplicate main.	18,250
Add maintenance cost of lines, repairs etc.	1,000
	19,250

DSR/8-11-38

Office of the Chief Engineer, P.W.D.
General, Buildings and Roads.

ENDORSEMENT No.764 WPH./39-1., dated 1st April 1939.

****

Read:-

Education and Public Health Department,
Memorandum No.824-1-E.2. dated the 27th March 1939.

****

Water Supply - Bellary Municipal Council - Memorandum presented to Hon'ble Minister (Local Administration) on 27th October 1938.

*****

With reference to its first request in paragraph 3 of the Memorandum presented to Hon'ble Minister (Local Administration) on 27th October 1938, the Bellary Municipal Council is informed that in accordance with the orders in G.O.No.2713 P.H., dated the 29th July 1938, the plans for the booster pump should be prepared in consultation with the Superintending Engineer (Public Health). In view of this, there is no need to give any direction to the Superintending Engineer (Public Health) in the matter.

G. H. Cooke,

Secretary to Government.

To The Commissioner, Bellary Municipality
through the Chairman, Municipal Council.

Copy to the Superintending Engineer (Public Health)
through the Chief Engineer.

****

F o r w a r d e d.

N.Govindaraja Ayyangar
31/3/39

for Chief Engineer, P.W.D.
General, Buildings and Roads.

To The Superintending Engineer (Public Health).

PUBLIC WORKS DEPARTMENT.

WATER SUPPLY - IMPROVEMENTS - BELLARY MUNICIPAL COUNCIL -

Memorandum presented to the Honourable Minister,

(Local Administration) on 27th October 1938.

******

From

Sri A.V.Raman, M.Inst. M & C.E., F.R. San.I.,

Superintending Engineer (Public Health)

To

The Secretary to the Government of Madras,

Education and Public Health Department.

Through

The Chief Engineer, P.W.D.,

(General, Buildings and Roads) Madras.

No. 315-C., dated 5th April 1939.

S i r,

Ref:- Memo No.824-1-E.2.P.H., dated 27th March 1939.

My predecessor in office, Mr. Westerdale, had gone into the question in great detail and made a report on the subject, to the Chief Engineer in this office No.131-C., dated 9th November 1938. In the absence of a decision as to what form the scheme of improvements should take, I am unable to offer any advice to the Municipality in the matter. I have informed accordingly the Commissioner, Bellary in this office No.29-L., dated 16th January 1939.

Sd. A.V.Raman

Superintending Engineer (Public Health).

****

Office of the Chief Engineer, P.W.D

General, Buildings and Roads.

ENDORSEMENT No.71 WPH./39-2., dated 12th May 1939.

Returned with reference to Chief Engineer's Memo No. 71-WPH./39-1., dated 26th April 1939.

N.Govindarajan

12/5/1939

for Chief Engineer, P.W.D.

To

The Superintending Engineer (Public Health).

Office of the Chief Engineer, P.W.D.

(General,Buildings & Roads).

Chepauk, Madras.

Memorandum No.71 W.P.H/39-1, dated 26th April 1939.

Sub: Water Supply - Bellary Municipality - Improvements-
Installation of new pumps-

Ref: From the Sanitary Engineer, No.131-C dated 9-11-1938.

A further examination of the comparative economy of the booster versus duplication of main has been made; the details of power and cost calculations are enclosed. It is readily admitted that when we pump 12 lakhs of gallons a day, the duplication of the main will be the more economical proposition. In view, however, of what the Sanitary Engineer has said in paras 10 and 12 (d) of his letter under reply, and in view of the very definite stand taken by the Sanitary Engineer in the case of Tuticorin Water Works - it is presumed it was taken by the Sanitary Engineer in consultation with the present Superintending Engineer (Public Health) - it is advisable to instal pumps which will not be in excess of requirements for the next 15 years -- the probable life time of the plant. The population forecasted in 1954 is only about 70,000 and at 15 gallons per head, only about 10 lakhs of gallons per day will be required. Till then the demand will gradually increase from say 7 lakhs. Statement 2 in the enclosure, makes it amply clear that so long as the demand is not more than 10 lakhs gallons, the extra cost of Boosting will be less than the saving in annuity of 19 thousand and odd rupees, the duplicate main will secure, vide last sheet of calculation enclosed to Sanitary

Engineer's

Engineer's No.131-C dated 9th November 1938. So, the Chief Engineer requested that the Sanitary Engineer will have, immediately, an estimate for installing a booster prepared by the Municipality; and that will be within his powers of sanction. He is requested to sanction the estimate after obtaining the Government's administrative approval to it.

II. The Head Works pumps which require urgent replacement should be designed for a duty of 10 lakhs of gallons a day, to work with the Booster.

III. Provided there is a standby for the Headworks pumps and the Booster, it is not clear what risk is referred to in para 6 of the Sanitary Engineer's letter. The Sanitary Engineer himself admits in para 9 of his letter that the pumps have to lift against 2 different heads which is a complication in itself. Now without a balancing tank, the Headworks pumps will - according to the Sanitary Engineer's proposals - have to discharge at one time 793 gallons per minute and at another time 860 gallons per minute and against a head of 240 feet at one time and a head of 235 feet at another time. To reduce the complication to the minimum, it is desirable to introduce a balancing tank before the booster, design the Head Works pump to a constant head, and relieve the booster to the extent possible from having to cope both with varying heads and varying discharges.

IV. The longitudinal section of the pumping main sent by Sanitary Engineer showing how the hydraulic gradients work out for:

(i) duplication of main by a 12" addition.

(ii) booster,

is now added to by another gradient line for a duplication of main with 18" addition.

For supplying 12 lakhs gallons, the booster entails, straining of the B Class pipes to a pressure of 226 ft. The duplication with a 12" main is no better involving as it does straining a length of 33,500' pipes to a head above 200 ft varying up to 271 ft. according to the Sanitary Engineer's proposals. Duplication of the existing 12" main with a new 18" pipe line would reduce the pressure to say not exceeding 235 ft. Even that will not entirely solve this problem of extra strain in the existing B Class pipes; and the 18" pipes will certainly cost more than the estimated cost of Rs.3.83 lakhs for a 12" duplicate main. Once it is conceded that B class pipes should be confined to a working head of 200', making an exception in the case of old existing pipes, will be exposed to the criticism of being not too logical. The existing 'B' Class pipes will have to be replaced by 'C' class pipes in the first reach of the existing main also. All this is in favour of the booster.

V. With reference to para 11 of Sanitary Engineer's letter, attention is drawn to para 7 of his letter No.695-G., dated 29--11--37 to the Government wherein the poor extent of fresh water zone has been adverted to. However, tests or no tests, it is advisable to provide for the extra supply by having a gallery or an additional well. The Superintending Engineer (Public Health) is requested to draw up a skeleton comprehensive programme providing for:--

1. Booster.

2. Gallery or an additional well required to increase the daily supply to 12 lakhs of gallons, the ultimate requirements.

3. To provide extra service reservoirs required.

4. To improve distribution to the extent necessary.

VI. The following further observations are made on minor points:--

(a) The Sanitary Engineer, Mr. G.V. Rao, stated in his letter dated 11th October 1935 that the new pumping sets must pump 13 hrs. a day to L. L. Reservoir and 11 hours a day to the H. L. one. Mr. Westerdale in para 9 of his letter dated 9-11-38 stated just the reverse - that is that the existing pumps pump for 13 hrs. to the H. L. Reservoir and 11 hrs. to the L. L. one. The difference should be explained.

(b) The calculations put up by the Sanitary Engineer assume 9½ hours pumping to the H. L. Reservoir and 14½ hrs. pumping to the L. L. one with different rates of pumping 795 and 860 G.P.M. respectively. Then the quantity pumped to the H. L. Reservoir will be 4,53,150 and to the L.L. one 7,48,200 gallons per day. The difference in supply will be large, while the population to be served by the 2 reservoirs as can be inferred by the capacities 1,00,000 and 1,14,000 of the existing reservoirs, is not very different. This also requires elucidation.

H.R.Dogra,
Chief Engineer,P.W.D.

To the Supg. Engr. (P.H.)
with C.E's Office calculations in 4 sheets.
1. L.Section showing pipe line.

Bellary Water Works Pumping

I For a supply of 8,00,000 Gallons
sufficient to meet the present demand.

I Booster arrangement.	Duplicating the Main 12" dia.
1. Pumping Plant at Head Works.	Plant at Headworks.
Discharge required	Discharge through each of the two ma
$= \frac{8,00,000}{24 \times 60} = 555$ G.P.M.	$\frac{555}{2} = 278$ G.P.M. Grade 1/1950
G.L. + 1330.	(a) To H.L. Reservoir
Pipe say at + 1330 } 200' (B. Class)	M.W.L. 1547.5
Lift say at + 1530 }	Foot Valve 1308 239.5
1530 - 1308 (Foot Valve) = 222.	Friction $\frac{47830}{1950}$ = 24.5
Pump Capacity :—	other losses say = 20
$\frac{555 \times 10 \times 222}{33,000} \times 2$ for efficiency	284
$= 75$ B.H.P.	Pump Capacity
	$\frac{2 \times 278 \times 10 \times 284}{33,000} \times 2 = 96$ B.H.P.
2. Plant at Booster Station	(b) To L.L. Reservoir :—
Grade for discharging	M.W.L. 1518
555 G.P.M. = 1/520	Foot Valve 1308
Frictional loss in 33,000'	210
$= \frac{33,000}{520} = 63.5$	Friction 24.5
other losses = $\frac{11.5}{75}$	Other losses 19.5
Pressure head available at Booster :—	254
Level 1308 + 222 - 75 = +1455	Pump Capacity :—
(a) Lift to H.L. Reservoir :—	$\frac{2 \times 278 \times 10 \times 254}{33,000} \times 2 = 86$ B.H.P.
To overcome :—	
Static Head 1547.5 − 1455 = 92.5	
Friction $\frac{14830}{520}$ = 28.5	
other losses = 7	
128	
Pump Capacity :—	
$\frac{555 \times 10 \times 128}{33,000} \times 2 = 43$ B.H.P.	

Statement I.

mark – Pumping Plant.

II – For a Supply of 9,00,000 Gallons
Sufficient for a few years more.

Booster arrangement.	Duplicating the main 12" D.
Plant at Headworks.	**Plant at Headworks.**
Discharge required $\frac{9,00,000}{24\times60}$ = 625 G.P.M.	Discharge through each of the two mains $\frac{625}{2}$ = 313 G.P.M.
G.L. + 1333.	Grade 1/1550
Pipe Lay at + 1330 } 200' (B. Glass)	(a) To H.L. Reservoir :—
Left- Lay at + 1530 }	M.W.L. 1547.5
1530 – 130.8 (Foot Valve) = 222	Foot Valve 130.8 — 239.5
Pump Capacity :—	Friction $\frac{47820}{1550}$ = 30.9
$\frac{625\times10\times222}{33,000}\times2$ for efficiency	other losses Say = 18.6
= 84 B.H.P.	289
	Pump Capacity :—
	$\frac{2\times313\times10\times289}{33,000}\times2$ = 110 B.H.P.
2. Plant at Booster Station	(b) To L.L. Reservoir :—
Grade for discharging :—	M.W.L. = 1518
625 G.P.M. = 1/410	Foot Value 130.8 210
Friction $\frac{33,000}{410}$ = 80.5	Friction 30.9
Other Losses $\frac{11.5}{92}$	other losses 18.1
	259
Pressure head available at Booster :—	
Level 1208 + 222 – 92 = + 1438	Pump Capacity :—
(a) Lift to H.L. Reservoir :—	$\frac{2\times313\times10\times259}{33,000}\times2$ = 98 B.H.P.
Static Head 1547.5 / 1438 — 109.5	
Friction $\frac{14820}{410}$ = 36.2	
other losses 7.3	
153	
Pump Capacity :—	
$\frac{625\times10\times153}{33,000}\times2$ = 58 B.H.P.	

P.T.O.

Booster arrangement. Duplicating the main 12" DM.

(b). Lift to G.L. Reservoir:—

Static Head 1518 − 1455 = 63

Friction 28.5

Other losses 6.5

98

Pump capacity :—

$\frac{555 \times 10 \times 98}{23.000} \times 2 = 33$ B.H.P.

3. Total duty of pumps at Headworks and at Booster.

Maximum 75 + 43 = 118 B.H.P.

Average $76 + \frac{43+33}{2} = 113$ B.H.P.

Total duty of Pumps.

Maximum 96 B.H.P.

Average 91 B.H.P.

Booster arrangement

Sufficiency for Years 12 & 20.

(b) Lift to G.L. Reservoir :—

Static Head 1518
1438
80

Friction 36.2

Other Losses say 7.8"
124

Pump Capacity

$\frac{628 \times 10 \times 124}{33,000} \times 2 = 48$ BHP

Total duty of Pumps at Headworks and at Booster.

Maximum 84 + 58 = 142 BHP.

Average 84 + $\frac{58 + 40}{2}$ = 137 BHP

Total duty of Pumps

Maximum — 110 BHP.

Average — 104 BHP.

III for a supply of 10,00,000 Gallons
sufficient say for some 12 to 15 years more

Booster arrangement.

1. Plant at Head works

Discharge required

$= \frac{10,00,000}{24 \times 60} = 695$ G.P.M.

Pipe say at +1320 } 200' (B. blaes)
Lift say at +1530 }

1530 − 1308 = 222' foot Valve.

Pump capacity :—

$\frac{695 \times 10 \times 222}{33,000} \times 2 = 94$ B.H.P.

2. Plant at Booster station

Grade for discharging

695 G.P.M. = 1/320

Friction $\frac{33000}{330}$ = 100'

other losses 12'

112

Pressure head available at Booster :—

Level 1308 + 222 − 112 = + 1418.

(a) Lift to H.L. Reservoir :—

Static head 1547.5

1418 129.5

Friction $\frac{14830}{330}$ = 45

other losses 8.5

183

Pump $\frac{695 \times 10 \times 183}{33000} \times 2 = 77$ BHP.

(b) Lift to L.L. Reservoir :—

Static head 1518
1418

100'

Friction 45'

other losses 8

153

Pump $\frac{695 \times 10 \times 153}{33,000} \times 2 = 64$ BHP.

Duplicating the main 12" Ø.

Plant at Headworks

Discharge through each of the two mains :—

695/2 = 348 G.P.M.

Grade 1/1250

(a) Lift to H.L. Reservoir

M.W.L 1547.5

Foot Valve 1308 239.5

Friction $\frac{47830}{1250}$ = 38.3

other losses 20.2

298

Pump $2 \times \frac{348 \times 10 \times 298}{33,000} \times 2 = 126$ BHP

(b) Lift to L.L. Reservoir :—

M.W.L 1518

Foot Valve 1308 210

Friction 38.3

other losses 19.7

268.

Pump $= 2 \times \frac{348 \times 10 \times 268}{33,000} \times 2 = 113$ BHP

III. For a supply of 12,00,000 Gallons ... which will be required some 20 years hence.

Booster arrangement

Plant at Headworks.

Discharge required = $\frac{12,00,000}{24 \times 60}$ = 833 G.P.M.

Lift say 250 feet

Pumps Capacity:—

$\frac{833 \times 10 \times 250}{33,000} \times 2$ = 126 B.H.P.

2. Plant at Booster Stations

Grade for discharging 833 G.P.H. = 1/230

friction $\frac{33,000}{230}$ = 143.5

other losses 11.5 / 155

Pressure head available at Booster:—

Level 1308 + 250 − 155 = + 1403

(a) lift to H.L. Reservoir

Static Head 1547.5 − 1403 = 144.5

friction $\frac{14,830}{230}$ = 64.5

other losses 9

218

(b) Lift to L.L. Reservoir:—

Static Head 1518 − 1403 = 115

friction 64.5

other losses 8.5

188

Pumps: $\frac{833 \times 10 \times 188}{33,000} \times 2$ = 95 B.H.P.

Duplicating the main.

Plant at Headwalls.

Discharge through each of the two mains.

833/2 = 417 G.P.M.

Grade 1/900

(a) Lift to H.L. Reservoir:—

H.W.L. 1547.5

~~Foot Valve 1308~~ 239.5

friction $\frac{42830}{900}$ 53.2

other losses 20.3

313

Pumps = $2 \times \frac{417 \times 10 \times 313}{33,000} \times 2$ = 158 B.H.P.

(b) Lift to L.L. Reservoir:—

H.W.L. 1518

~~Foot Valve 1308~~ 210

friction 53.2

other losses 18.8

283

Pumps: $2 \times \frac{417 \times 10 \times 283}{33,000} \times 2$ = 143 B.H.P.

P.T.O.

Booster arrangement	Duplicating the main 12" DM.
3. Total duty of pumps at Head Works and at Booster.	Total duty of Pump.
Maximum 94+77 = 171 B.H.P.	Maximum = 126 B.H.P.
Average 94 + $\frac{77+64}{2}$ = 164 B.H.P.	Average $\frac{126+113}{2}$ = 119.50 B.H.P.

Booster Arrangement.	Duplicating the Main.
Total duty of Pumps at Head works and at Booster.	Total duty of Pumps.
Maximum 126 + 110 = 236 B.H.P.	Maximum = 158 B.H.P.
Average 126 + $\frac{110+75}{2}$ = 228 B.H.P.	Average $\frac{158+143}{2}$ = 150.5 B.H.P.

Statement 2.

Working costs per year.

Extra cost on account of Booster.

I. For pumping 8,00,000 gallons per day.

Establishment (as per Sanitary Engineer's estimate)	..	Rs. 3,000
Cost of Electrical energy @ 0.8 per unit $(113 - 91) \times \frac{3}{4} \times 24 \times 365 \times \frac{0.8}{16}$	..	7,227
Add for repairs and renewals @ 10% as in Sanitary Engineer's estimate	..	723
Total.		Rs. 10,950

II. For pumping 9,00,000 gallons per day.

Establishment as above	..	Rs. 3,000
Electrical energy $(137 - 104) \frac{3}{4} \times 24 \times 365 \times \frac{0.8}{16}$	..	10,841
Add for repairs and renewals @ 10%	..	1,084
Total.		Rs. 14,925
		say 14,930

III. For pumping 10,00,000 gallons per day.

Establishment as above	..	Rs. 3,000
Electrical energy $(164.5 - 119.5) \frac{1}{4} \times 24 \times 365 \times \frac{0.8}{16}$		14,783
Add for repairs and renewals @ 10%	..	1,478
Total		Rs.19,261
		or say 19,260.

IV. For pumping 12,00,000 gallons per day.

Establishment as above	..	Rs. 3,000
Electrical energy $(228.5 - 150.5) \frac{5}{4} \times 24 \times 365 \times \frac{0.8}{16}$	..	25,623
Add 10% for repairs and renewals	..	2,562
Total.		Rs.31,185
		say 31,200

BELLARY WATER WORKS IMPROVEMENTS - Pumping Plant.

Comparative costs of Booster station and Duplicate main for pumping 12,00,000 gallons.

Booster arrangement.		Duplicating the main.	
Pumps :-		Pumps	
at Headworks ..	Rs.22,000	at Headworks ..	29,000
at Booster station.	22,000	Electrical Equipment	
Electrical equipment etc.		at Headworks. ..	10,000
at Headworks.	10,000		
at Booster Station.	10,000		39,000
	64,000		
Pipe connections		Pipe connections.	
at Head works ..	2,000	at Headworks ..	2,000
at Booster Station.	2,000		
Booster Station with staff quarters	13,000	Duplicate main ..	3,83,210
	17,000		3,85,210
Total capital cost.	Rs.81,000 excluding cost of a balancing tank.	Total capital cost.	Rs.4,24,210
Annuity for 64,000 at 3½% interest for 20 years ..	4,503	Annuity for Rs.39,000 for 20 years	2,744
-do- for 17,000 for 30 years ..	925	-do- for 3,85,210 for 30 years ..	20,944
Total annuity.	Rs. 5,428	Total annuity. ..	23,688
		Add maintenance and repair of new main ..	1,000
			24,688

PUBLIC WORKS

Sri.A.V.Raman, M.Inst. M & C.E. F.R. San. I.,
Superintending Engineer, (Public Health),
Triplicane, Madras.

Dnisori

Chief Engineer, P.W.D.,
(General, Buildings and Roads), Madras.

No. 583-C dated 20.6.39.

Sub: Water Supply--Bellary Municipality--Improvements--Installation of new pumps.

Re. Your No. 71WPH-39-1 dated 26-4-39.

1 Note.

I enclose a note giving figures to establish that it would not be economical to put off the duplication of the pumping main and to install the booster immediately to meet the requirements for 15 years.

The question is also one which deserves a reconsideration in the light of the following remarks which I venture to submit with due deference to your decision in the matter:

1. There is one fundamental fact which deserves to be borne prominently in mind. It is this--while designing water supply schemes for local bodies it would be in their interest to design schemes with the minimum maintenance charges. In such a case though the capital cost may be increased, it will be compensated for by the reduction in maintenance charges. There will thus be no net increase in the cost of the scheme taking both initial and maintenance charges into account. But as a moiety of the capital cost is borne by Government while the maintenance charges fall exclusively on the shoulders of local bodies, the advantage to local bodies by choosing a scheme with low maintenance charges is obvious.

2. In view of the admission that when 12,00,000 gallons a day should be pumped, it would be an economical proposition to

to duplicate the main, the question arises why the main should not be duplicated even to start with. My submission is that by the expenditure of the extra estimated maintenance charges of Rs. 19,260, the Municipality does now own at the end of the period any material of its own. The bulk of the money spent on this is money given away to the electrical undertaking. On the other hand, if the extra maintenance charges are utilised for the payment of the annuity on the cost of the duplication of the main, the Municipality not only conveys through the pipe line the quantity of water which an extra expenditure of Rs. 19,260 would convey to the town but also have at the end of the period the main intact which would last at least 45 years more.

3. It is true that the previous Sanitary Engineer and myself had discussions on the issueh under consideration. It is the correct principle that no pump, particularly electrical driven pumps, should be specified to meet an ultimate demand 30 years hence, when the life of the pump would be perhaps half that period. But there is this distinction. The mains are laid not to convey the quantity likely to be pumped within the life time of the pumping plant but the quantity required for the ultimate population of 30 years hence. Therefore it is not a correct presumption that we will have to deal with 1954 population only in this case. I submit, it is therefore fallacious to argue a point of economy on the assumption that we are dealing with the requirements of 1954.

4. As regards the necessity for replacing a certain length of the existing B class main with C class pipes, such replacing would appear logical on the presumption that the B class pipes should not be subjected to a pressure greater than 200' head. The B.S.S. does not in any way restrict the working pressure to 200 ft. head. In a foot note in the older specification, this was merely thrown out as a suggestion. Even this foot note has

been

been deleted in the latest specification. But in this very instance the B class pipes in the upper reaches from the pumping station, have been subjected to a considerably greater head than 200' when both the pumps were simultaneously pumping into the common main. A pressure up to ~~220~~ 260 ft. had been put on the main without anything untoward happening.

5. The provision of C class pipes in the proposed duplicate main need not be for a length of 33,500 ft. It would be sufficient if this class is used for a length of about 24,000 ft. If this be done the cost would come down from 3.83 lakhs to 3.70 lakhs.

6. I have given my independent consideration to the question dispassionately, irrespective of the controversy which had taken place in the past. Judging the question from fundamentals and keeping in view the desirability of limiting the head in the existing main to the usual 200', I consider that:-

(1) The proposed new plant at the head works should be designed to serve 70,000 people at 15 gallons per head per day. To limit the maximum permissible head for B class pipes and to induce the extra head required near the delivery end of the pumping main, I propose to install a booster to deliver the quantity required both in the high level and the low level reservoirs. The economy of the proposition, I submit, is obvious. Instead of providing a pumping plant of higher duty at the head works and thereby inducing a head which would necessitate the use of C class pipes in certain reaches, it is desirable to split up the power of the unit in two places, viz., one at the head works and the other at the foot of the hill where the service reservoirs are located. This proposal has the advantage of ensuring better control and maintenance of the minimum establishment. In point of fact I would not have any elaborate special establishment at all at the booster station at the foot of the

the reservoir. I would be content to have an electrician in charge for each of the shifts. I illustrate the proposal in the hydraulic section enclosed; and

(ii) The duplication of the main using exclusively B class pipes should go forward simultaneously, designing it to carry the ultimate requirements of the town 30years from the time the main is laid.

7. The cost of the proposal now put forward for your consideration is given as annexure "A".

D.Gopalakrishnamachar 19.6.39
SUPERINTENDING ENGINEER (P.H.)

GR/16-6-39.)

N O T E.

C No. 944-C 7/5-5-39
Enclosures

It has been readily admitted that the duplication of the main will be the more economical proposition for the ultimate demand of the improvement scheme. When it is considered that the duplication of the main will be necessary after 15 years, when more than 10 lakhs of gallons will have to be supplied the extra recurring charges by way of maintaining the booster plant and its depreciation should, it stands to reason be avoided. The Municipality will have to incur additional recurring charges to the extent of

Rs. 18,050 (Establishment ... Rs. 3,000
Cost of Electrical energy 1473 x $\frac{9.25}{10}$ Rs.13,675
Repairs and renewals at 10% Rs. 1,367
18,042 or
18,050)

on an average per annum for pumping on an average 925,000 gallons a day at the rate of 15 gallons for a population of 62,000 for the period of 15 years. In addition, the additional capital expenditure which the Municipality has to incur on account of the booster scheme will be Rs.45,000 as under.

Difference in cost of pumps		may	Rs. 15,000 } 20 years life
2.	do	in electrical equipment.	10,000 }
3	do	in pipe connection	2,000 } 40 years life
4	Booster station and quarters		13,000 }
5.	Balancing tank		5,000 }
			45,000

The interest on the capital expenditure and depreciation allowance for the various items of work will be Rs.~~3,829~~ 3222. The Total annual outlay will thus be 18,050 plus 3229 or ~~21,270~~ 21227. As against this the interest for the capital

outlay

outlay of Rs. 3.70 lakhs required for duplicating the main and the depreciation of the main during the period of 15 years out of its average life of 60 years will be only Rs. 14,837 per annum (3,700 x 3½ (12950 plus 3700 x .51 (1887)). The booster scheme is distinctly disadvantageous to the extent of Rs. (~~21279~~ 21297 — 14837) or 6440 per annum on the whole and to the extent of 6440 plus ½ x 12950 or Rs. ~~12,917~~ 12,915 to the Municipality.

ANNEXURE

CAPITAL COST OF IMPROVEMENTS.

DUPLICATION OF THE MAIN:

		Rs.
46,735 feet of 12" B Class pipes at 6/14/0 Say		3,35,000
MAIN STATION.		
Pumping Sets.	...	19,000
Electrical Equipment	...	10,000
Pipe Connection	...	2,000
Booster station at the foot of the Service Reservoir.		
Pump sets and valves	...	3,500
Electrical Equipment	...	4,500
Buildings	...	2,000
	Total	Rs.3,76,000

(N.B.--This does not include centage as it was not taken into account in the previous comparisons).

ESTABLISHMENT AT THE BOOSTER:

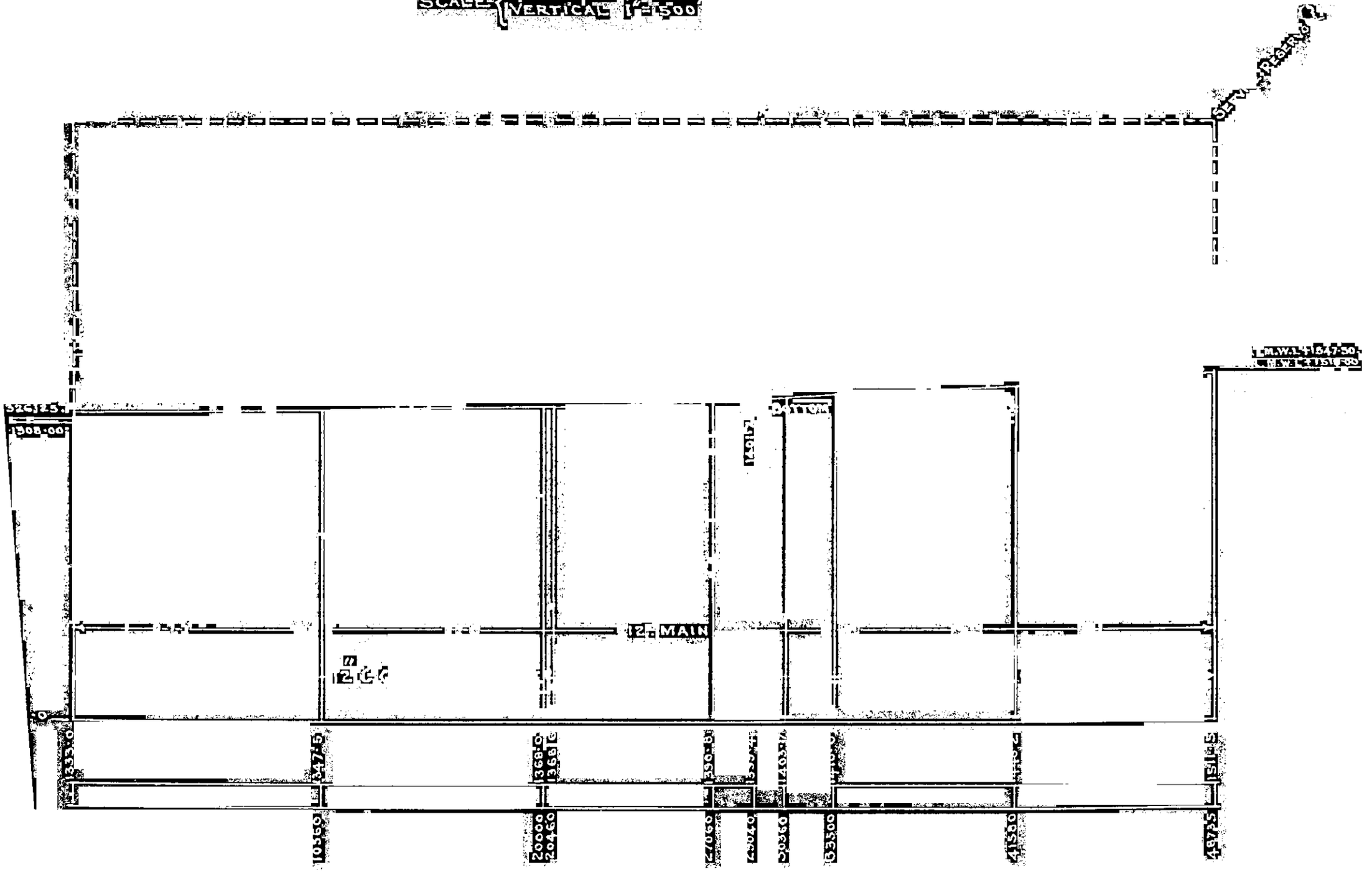
3	Electricians @ 25-3/2-40.	Avr. 34-12-0.	Rs 104-0-0
3	Cleaners at 12-½-15	" 14-2-5	43-0-0
		Per month	147-0-0 or Rs 150/-
	Cost per annum.	..	Rs 1,800

****

BELLARY WATER WORKS

LONGITUDINAL SECTION OF 12" DUPLICATE MAIN

SCALE { HORIZONTAL 1" = 5000'
VERTICAL 1" = 500



dy 4/1/40

61

E&P 4

~~Telephone~~

~~To~~

Memo. No 33328-2 E&PH dy 3-1-40

~~The C E (Hospet)~~

Bellary water-Supply improvements - Ref: your letters No. 71WPH dy 10-8-39 and 30-10-39

In the Comparative Statt. referred to in para V of ~~your~~ The CE's letter No. 71 WPH dy 10-8-39, the words "B.H.P" presumably refers to electrical charges. ~~Please say whether~~ The CE is requested to say if the presumption is correct.

p 8 cf.

In para 4 of Mr. Westerdale's letter No 131-C dy 9-11-38 ~~writes about~~ & sent with ~~your~~ letter No. 71 WPH dy 30-10-39, the cost of electrical energy is shown as Rs. 77,526 under the heading "Booster proposal - annual expenditure". ~~Please~~ ~~Say~~ state ~~what~~ the actual electrical charges ~~are~~ ~~towards~~ will come to for working the Booster scheme.

p 13 cf

The CE is requested ~~report~~

~~P.C~~

Dft to the C.E by Car

5-1-40.

28/12/39

23/12/39

JRK

3-1-40.

PUBLIC WORKS DEPARTMENT.

PDS 2201

42

Received 16 JAN 1940 19 . Registered 19

Subject

Bellary Water Supply Improvements -

Ref:- Government Memo.No.33328-2-E2 P.H., dated 3rd January 1940.

****

ENCLOSURES.

No.

Spare copies

No. 71 W.P.H/39-5

Station Chepauk, Madras, Dated the 16th January 19 40.

From (Name) H.R. DOGRA ESQ., B.Sc.,
Chief Engineer, P.W.D.
(Designation) (General, Buildings & Roads)

To The Secretary to the Government of Madras,
EDUCATION & PUBLIC HEALTH Department.

Sir,

"B.H.P." is a contraction for Brake Horse Power. In the statement furnished with my letter No.71 W.P.H/39-3, dated 10th August 1939 the "B.H.P." bears reference to the numbers 113, 91, 164.5 and 119.5 over which it is written. The electrical charges are in rupees and are given under the column 'Annual cost to the Municipality'. They are Rs.37,121, 29,894, 54,038 and 39,256 as the case may be according to the statement.

2. With reference to the latter part of the Government Memo., the amounts worked out compare as below:--

P.T.O.

	Mr.Westerdale's estimate for Booster alone	Superintending Engineer's (P.H.) estimate for Booster and duplicate main.		Chief Engineer's estimate for Booster alone.	
Supply per day.	12,00,000 gallons ultimate requirements.	8,00,000 gallons present requirements.	10,00,000 gallons requirements 15 years hence.	8,00,000 gallons present requirements.	10,00,000 gallons requirements 15 years hence.
	Rs	Rs	Rs	Rs	Rs
Electrical charges. (to be borne by Municipality).	77,526	29,894	39,256	37,121	54,038
Total annual cost to the Municipality including electrical charges, establishment and annuity on half capital cost etc.	90,980	42,916	52,278	42,459	59,376
Cost to Government (annuity on half capital cost).	2,700	10,222	10,222	2,338	2,338
Total cost to the Municipality and Government.	93,680	53,138	62,500	44,797	61,714

3. I request early orders of Government on the point raised in para 2(i) of my letter No.71 W.P.H/39-4, dated 30th October 1939. I should consider that where mains are duplicated solely with a view to reduce pumping charges, the cost of the duplicate mains should be borne by the Municipalities who are benefitted by the saving of the extra pumping charges.

W.K. Ramanathan
17.1.40

for Chief Engineer, P.W.D.

S.S.18/1/40.

18.1.40

Ex P H

Cvo. 33328. From the C. E (Gen) No. 71-U P H Dt 10-8-38

Water Works - Bellary Mcl. Improvement

In order to provide House Service connections in the municipality and thereby increase the revenue, the Bellary Mcl in its resolution No. 22 Dt 27-1-38 proposed that estimates for the duplication of the 12" main might be prepared and that the pumping plant might be electrified. (I) 36

The Chairman also interviewed H.D (P.H) (I) 61-63 in the matter. Finally the C.E stated that there was no need to have a duplicate main and that a booster pump might be installed. (I) 42-43. This views were accepted and communicated to the Council with a request that plans and estimates for the booster pump might be prepared in consultation with the S.E (P.H) - vide Go 2213 P.H Dt 25-7-38 (I)

2 It will appear from paras II & III of the letter on pp 2-4 of that Mr. Westerdale and the present S.E (P.H) have held "that a duplicate pumping main is necessary". The C.E has not however sent copies of their views to Govt.

He states that he sees no need to be prolonging the discussion with the S.E (P.H) and requests early orders, after consulting the Council if necessary, confirming the Orders in G.O. No. 2713 P.H of 29-7-38. (

Ordinarily no further orders are called for in this matter; but in this case there is a difference of opinion ~~has arisen~~ between the S.E (Mr. Westerdale) and the S.E (P.H) on one side and the C.E on the other about the necessity for a duplicate pumping main. The Council itself had previously proposed a duplicate pumping main and it will only confirm its view, if a further reference is made to it now as proposed by the C.E.

3. Before orders are passed, it seems desirable to obtain from the C.E copies of the letters of Mr. Westerdale & the S.E (P.H). The Council has, in its address proposed to be presented to H.E, reiterated the necessity to grant House-Service Connections. A draft memo. is placed below for appl.

18/10/39. CE's letter is difficult to follow without the two letters of Mr. Westerdale & the present SE (P.H.)

For orders.

18-10-39 S.

W is for WM's orders whether we should accept the recommendation of the C.E. without further argument or whether we should call for further information before the issue of the draft

8.X.39

M (P.H.) Let us have further information before the draft may issue.

19/10/39

SECRETARY. EDN. AND P. H. DEPTT.
19 OCT 1939
GOVERNMENT OF MADRAS

[Memo. No. 33328-1 E&PH dt 19-10-39]

pp 9 of

pp 10-11 of

C No. 4566. From the C.E No. 71-WPH dt 30-10-39

Mr. Wastendale's letter on pp. 12-16 of contains very strong arguments in favour of duplication of the pumping mains and against the proposal of the C.E to have only a Booster pumpset. He also points out

para 8 on p 14 of

that even with the use of a Booster pump it is not possible to exceed the working pressure for a 'B' class pipe, which has been used for the main mr. and that the existing two Service reservoirs will be inadequate to balance

para 9 on p 14 of

either 9 lakhs or 12 lakhs gallons supply the demand of against 6 lakhs of gallons for an ultimate the present population of 50,000 at 10 gallons per head per

day plus One Lakh gallons per day to the Fort and Cantonment areas.

After a perusal of Mr. Westerdale's dyeasting, the C.E suggested that a Skeleton Comprehensive programme might be prepared / providing in addition to the booster pumps for :- para V on pp 25-26 of

a) Gallery or an addl. well required to increase the daily supply to 12 lakhs of gallons, the ultimate requirements, 'A' on p 26 cr-

b) extra service reservoirs required and

c) improvements to the distribution system to the extent necessary. The S.E (P.H) (Sri Raman) has also agreed with Mr. Westerdale that the duplication of the pumping main is necessary and he has dealt with this aspect very exhaustively in paras 1 to 4 of his letter on pp 33-35 of. The S.E (P.H) has also summarised his recommendations in para 6 of his letter on pp 35-36 of. pp 33-35 cr-

According to him, the cost of the duplication of the main and the booster pumps will be Rs. 3,76,000/- and p 38 of.

if the booster pumps alone is taken up now, there will be a distinct disadvantage of Rs. 6,460 per annum on the whole or Rs. 12,915 to the municipality. 'B' on p 37 of.

The C.E (B&R) has evidently ignored

the various arguments advanced by Mr. Westerdale and the S. E (P. H) on the only consideration that the economy of the duplication of main will not be realised for the next 15 years, when the booster pumps proposed may have to be replaced. He states that it cannot be said for certain what exactly the conditions would be after 15 years and what improvements if any will be required then. Mr. Raman has differed from the C. E that for the present the improvements which are taken up should deal with 1952 population only i.e 15 years; The reasons given by him appear to be sound.

2. It will be observed that there is a difference of opinion between Mr. Westerdale and the S. E (P. H) on one side and the C. E on the other on a technical matter relating to a sanitary work. The question to be decided therefore is

1) Whether the opinion of the Specialist Officers should prevail in the matter,

2) Whether the booster pumps suggested by the C. E. will be sufficient

para 3 on p 3 ante

for the ultimate demand of 12 lakhs gallons per day, and or whether additional improvements should also be made, and

3) Whether the (following) Views of Mr. Westerdale ~~that~~ will be agreed in:

a) that the booster pumps will cost a sum of Rs. 14,830 in annual recurring expenditure more than the Duplication of main, p-13 of

b) that the booster pump has disadvantages in the maintenance of an addl. pumping station and staff with the attendant risk of failure of pumps duplicated and

c) that the capacity of the existing two Service reservoirs will become more disproportionate thereby necessitating additional reservoirs, ~~will be) wise~~

4) Whether apart from the controversy, the scheme to be suggested should be designed with a view to reduce the maintenance or annual recurring charges irrespective of the commitment to the cost involved in the scheme, and p-11 of

5) Whether the scheme should be designed so as to provide the quantity required for the ultimate population of 30 years from now or only to convey the quantity likely to be p. 34 of

pumped within the life time of the existing pumping plant which according to the C.E will be only 15 years more i.e upto 1954.

3. It may be pointed out that in a controversial matter like the present one, the C.E should not have withheld the opinions of Mr. Westerdale and the S.E (PH) from the Govt. It does not appear that he has considered the necessity for a duplication main seriously at all; nor has he definitely stated anywhere that the disadvantages pointed out by Mr. Westerdale in having a booster pump will can be ignored. It seems that his intention is evidently to commence the booster pump first and take up the remaining items specified in para 2 on pp 12 & 13 CF gradually perhaps even by keeping the estimate open for a long period.

4. The Council is anxious to provide House Service Connections and thereby to increase its revenue and it has suggested that estimates for

the duplication of the main may be prepared. Mr. Westerdale and the S.E(P.H) have accepted the Council's suggestion. As it is the Council which has primarily to decide the nature of the scheme which it should frame, it is for consideration whether the views of all the three officers may be communicated to it, and its remarks obtained. The C.E has suggested that the Council may be consulted if necessary on the proposals dealt with by him.

5. For orders.

No. Differing views should not be communicated

pbg SRV 6.12.39

le 15/XI/39 23/XI/39

Much of the controversy in this case seems to be futile. Technical officers seem to take great gusto in controversy which to a lay man like me seems beside the point

It is admitted that duplication of main suggested by Mr. Westerdale means (a) higher capital cost

moiety of which falls on the Govt; and

(b) lower maintenance cost — advantage of which accrues entirely to the McPlly.

Disadvantages are pressure in the 1st, 33 500 feet is above 200 ft. head — max^m head being 271 feet when pumping 12 lakhs of gallons per day. (The pipes are subjected to a test pressure of 400 feet head before being laid but working practice limits it to 200 feet normally)

Booster station alone means a higher maintenance cost! Mr. Raman's proposal is to duplicate the main and have a booster at the tailend of the pumping main. It cannot be denied that if the ultimate quantity to be pumped in the neighbourhood of 12 lakhs of gallons per day, this proposal may be adopted. is advisable.

The situation is further complicated by the fact that in the present financial stringency expensive schemes cannot be contemplated immediately.

An order may therefore issue on the following lines:

(1) The scheme (improvements) should be designed for an ultimate consumption of 12 lakhs of gallons.

(2) The immediate needs are to be met by a booster station to provide for a progressive increase of consumption from 6 lakhs of gallons (the present consumption) to something up to 10 lakhs by which time ~~the life of~~ the booster works need replacement.

(3) Duplication of the main to be taken up in due course.

(4) The scheme to be drawn up in such a way that item (2) will fit into the comprehensive scheme. The site of the booster station should be selected so as to fit in with the comprehensive scheme.

It is presumed that not much harm will be done if the main contains the subject

to pressure of slightly more than 200' head for some time to come at any rate. With the examples of Madras City & Madura before us it would definitely be unwise to design a shortsighted scheme confining ourselves to the demand in the next 15 years. Towns have a way of growing. Provision of w.s & drainage definitely accelerates their growth because people round about will find life more comfortable — one need not carry water from long distances. In a Dt. like Bellary where drinking water is scarce this tendency will definitely be accelerated.

P 69

Re the specific issue raised at "K" on page 11 of although no hard and fast ruling can be given Govt. generally aim at keeping maintenance charges at a reasonably low level. Because they pay half grant Govt. should not in equity tie a millstone round the necks

of local bodies by deliberately going in for cheap schemes with high maintenance costs as against ~~schemes~~ schemes with lower maintenance costs. The very purpose of the grant is to assist a local body and this assistance should take the form in which the local body would get the best out of the scheme. Not being a recurring contribution a little more (capital) expenditure is not generally objected to.

We need not go into "R" on page 11 cf for the present.

(omitting 1st para) A copy of ~~my~~ The note- may be sent to C.E. with the current file for offering his views before the issue of orders.

["A" above is an expression of my view; the question has not been categorically

333286
A3/IV

XB 56

put and decided to my knowledge.]

Yr orders.

SRK
6.12.39
S.

Mr Locke A3 wd see Mr LCO as Mr Stage: we are faced with a very definite conflict of opinion on a technical question, between Mr Dyson on one side, and Messrs Westcott and Laman on the other.

It is not likely that any money will be forthcoming in the immediate future for either scheme, so perhaps the question may be left over for a while, until we are likely to get an authoritative opinion from CE & SE (P.W.)

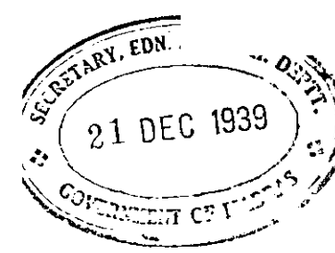
A3

P.W.D.

Please see page 8 of. I presume BHP etc in his statement is electrical charge. Now on page 134 Mr. Westcott (I presume) has shown the cost of electrical

energy ask JJ, s-26. On this appears to rest the alleged extra cost to the municipality of the Booster scheme. Before we go any further we must ascertain which is the correct estimate. If the Booster can be safely worked with at double main, then having regard to provincial finances we should stick to that even though it may cost a little more to run.

TMR
20/12



Memo

A draft ~~F.M~~ to the C.E is placed below for appl.

R
30/11/39.
SD
23/12/39.

SRK.
3.1.40

[Memo. No. 33328-2 E&PH dy 3-1-40] pp 41 of C No. 2204, From the C E (B&S) No. 71 WP dy 16-1-40 pp 42-43 of

Please see ~~It will be observed from the~~ on p. 43 of figures showing the Comparative cost of the Booster scheme, ~~Mr~~ Mr. Westerdale's

3532 Ex
23/1

are based on the

estimates ~~of Rs. 2700 against both~~ ultimate requirements of 12,00,000
~~of the C.E for Rs. 2238 will have to~~ gallons whereas C.E. stops with
~~be preferred in the present case as~~

10,00,000 gallons.

para 4 on p. 5 ante (T)
p. 7 on p. 7 ante (T)

The Council is anxious to have the a design providing for an ultimate pumping of 12 lakhs gallons per day.

2. Para 3 of the C.E's letter on p. 634 Please see the notes at 'A' on top 11-12 ante.

3. For orders.

23/1 SRK 23/1/40.

SRK
23.1.40

S.

23/1/40.

A3

I think we should pass orders once confirming our previous approval of the C.E's scheme. It is now for the experts advisers to say what their advice is. And so far as a layman can judge his advice in this case seems sounder than that of Mr. Rowan. On a very long view Mr. Rowan may be correct but the C.E's 15 years is far enough to look ahead.

The Basket scheme is evidently safe whether double mains or the annual cost is not much more.

We need not answer the theoretical questions propounded by the C.E. The first does not admit of a definite general answer. As for the 2nd, the loan period need not necessarily correspond with the life of the pipe.

I think it therefore that the scheme will have to be referred to the financing Dept. and it will be taken up separately.

HY 27/1/40

SECRETARY, EDN. AND P. H. DEPTT.
27 JAN 1940
GOVERNMENT OF MADRAS

Please see para VI of the C.E's letter on pgs 6-7 of. The Govt. have already informed the Council that they can prepare plans and estimates for a booster Station estimated to cost Rs 75,000/- in consultation with the S.E. - It is perhaps unnecessary to consult the Council again in the matter. The question about the financing of the scheme has to be

(I) 75-76
(I) 42-43

Considered only after the plans and estimates are received.

2. A draft order is placed below for appl.

SRG
30.1.40

29/1

S.

30.1.40

36/31/1 Dy 3/11

C No 33328. From the C.E (GOSA) No. 71WPH Dy 10-8-39

" 45666 " Dy 30-10-39

2206 " Dy 16-1-40

Godda No

386 P.H. Dy 31.1.40

Water Supply Scheme - Bellary Md. Cl. Improvements - Plans and estimates - Preparation ordered.

The Govt. are pleased to confirm their orders in G.O. No. 2213 PH Dy 29-7-38 approving the scheme for a booster station with a balancing tank proposed by the C.E (GOSA)

2. The C.E (GOSA) is requested to arrange for the preparation of plans and estimates for the scheme as soon as possible. The question of financing the scheme will be considered after the plans and estimates are received.

(I) 75-76

D/7.2.40

I

To the C.E (GOSA)

" Comm. Bellary Mdg

this the CM C

6/25/1 SD 29/1/40

SRG 30.1.40

30/1/40